the metal by pressure at its back; and when the telescope is moved towards the zenith, the plates yield again by the weight of the speculum, while the lower edge, still in hard contact at the points of support, is unduly borne up there, and the equilibrium is destroyed. To remedy this evil I have slung the speculum in a hoop of thin iron, equal in length to half its circumference, the ends of the hoop being attached to swivels fixed in each of the two horizontal brackets, and the lower part of the hoop being thus quite at liberty to rise and fall with the plates.

"This has nearly, if not entirely, removed all perceptible distortion; yet in some positions, and under some circumstances, vestiges of it are to be perceived. I have devised a plan of supporting the metal laterally by an equal tension on the several points of support, and think it may probably be useful; but I have not yet had leisure to carry it into effect.

"Instead of a plane speculum I usually employ a prism, which transmits a pencil two inches in diameter, made for me by Messrs. Merz and Son, of Munich. I am persuaded, from repeated experiments, that the prism has an obvious advantage in light over a speculum, and the material is so fine, and the surfaces so exquisitely wrought, that no perceptible injury of the image exists. The only care necessary in the use of the prism is to preserve it from dew, which it is extremely liable to collect; this I have remedied by having a chamber made in the mounting of the prism, which receives a cube of cast iron enveloped in thick *felt*: this, being moderately warmed and placed in the chamber, effectually prevents the deposition of dew for at least some hours, while the extremely slow radiation through the felt does not produce any sensible disturbance in the formation of the image. The prism is rather small, for though it transmits the entire pencil, there is scarcely any thing to spare, and had it been easy to obtain a sufficiently good one half an inch larger, I should have procured it."

A short Notice of the Equatoreal of the Liverpool Observatory. By Mr. Hartnup.

As the Astronomer Royal will probably give some account of this instrument, which has been constructed on his recommendation and entirely under his superintendence, Mr. Hartnup states, in a few words, that it is of the English construction; that is, the telescope is a transit supported at each end, between two long supports which form the polar axis. The telescope is by Merz of Munich, $8\frac{1}{2}$ inches in aperture, and 12 feet focal length. The circle and declination-circle are each 4 feet in diameter, divided by Mr. Simms upon his "self-acting circular dividing engine."* The

* Described in Vol. xv. of the *Memoirs*. The new altitude and azimuth instrument at Greenwich, which was divided on the same engine, is considered by Mr. Airy to be exceedingly well divided.

hour-circle revolves independently of the instrument, and is carried by clock-work, the moving power of which is a water-mill, regulated by "Siemen's *Chronometric Governor.*" This is so successfully applied, that the rate of the hour-circle is not sensibly altered by clamping the polar axis to it. When the hour-circle is properly adjusted, the instrument reads off right ascensions at once.* The polar axis, which is of wrought iron-plate, is very massive and stiff. The weight of the whole instrument is between 70 and 80 cwt. This keeps all steady, even in very hard gales. The instrument is abundantly supplied with eye-pieces and micrometers. The stiff frame and large circles were evidently designed by Mr. Airy to supply a peculiar power to the instrument. In ordinary mountings, great accuracy is not to be expected when the star of reference is more than a few minutes distant from the object compared. The screw of the micrometer is not to be relied upon for larger spaces, and the circles, though sufficient for finding and identifying, are seldom intended for accurate measures. Stars of comparison can, indeed, generally be found which are contained in some of the special and extended catalogues, but such stars can only be considered to be roughly known, and in many cases fail altogether. The Liverpool equatoreal is intended to measure *by its circles* intervals of a few degrees, with as much accuracy as the average stars of our extensive catalogues possess, and thus to give excellent places by reference to well-known stars.

Mr. Hartnup has made some observations to test the powers of his equatoreal in this respect. The observations of γ, α, β *Aquilæ*, of α and β *Lyræ*, of *Castor* and *Pollux*,† shew satisfactorily, that within such limits as these the instrument will measure differences of right ascension and north polar distance almost, if not altogether, as well as can be expected from the best meridian instruments.

Mr. Hartnup further remarks, that the instrument keeps its adjustments steadily, which seems to shew that it is not only firm in itself, but, also, that it rests on a sound foundation. The observations by Mr. Hartnup, of standard stars in all parts of the heavens, are not sufficiently numerous to yield a safe estimate of the probable error of a single independent determination, but it is evidently very small, even for stars at 6^h from the meridian.

Mr. Bishop's Ecliptic Charts, from Observations at the South Villa Observatory.

Our treasurer, Mr. Bishop, has lately published the first hour of an ecliptic chart for the epoch 1825. This contains all the stars to the 10 mag. inclusive in a zone of 6° of latitude, 3° on each side

* This contrivance is peculiar to the equatoreals of Cambridge and Liverpool, and in some researches is of great convenience.

† These observations are given in detail in the accompanying memoir.